

# **Headquarters U.S. Air Force Safety**

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*Safeguard Airmen/Guardians – Protect Resources – Enable Mission Success*

## **Human Factors Refresher**



**AFSEC/SEH  
27 Mar 2023**

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## Overview

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- **Human Factors Definitions and Philosophy**
- **Human Factors in Mishap Investigations**
- **Human Factors Analysis and Classification System (HFACS)**
- **Define Human Factors vs HFACS**
- **Human Factor Resources**

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# *The Human Contribution*

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- **There is a human component to every system**
  - E.g., operator, maintainer, designer, user, interpreter
- **Performance = Behavior + Results<sup>1</sup>**
- **Humans create safety**
  - We can learn from success.
- ***Errare humanum est...***
  - ...to forgive, divine<sup>2</sup>
  - We can learn from error.

1. U.S. Department of Energy “Human Performance Improvement Handbook, Volume 1: Concepts and Principles”

2. Alexander Pope, “Essay on Criticism”



## ***Human Factors Definition***

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**A body of scientific knowledge focused on the interaction between human characteristics, and areas such as:**

- **Technology**
- **Functional design, and**
- **Systems**



# *Human Factors Philosophy*

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**“When conducting human error investigations, you have to assume that people were doing reasonable things given their circumstances.” <sup>1</sup>**

**“You can’t understand why an accident occurred until you discover why the actions taken that led up to it made sense at the time. Pointing out mistakes made along the path to disaster is nowhere as useful as figuring out why the people who made them didn’t know they were mistakes.” <sup>2</sup>**

1. Sidney Dekker “The Field Guide to Human Error Investigations” (Emphasis added)

2. James Reason “The Field Guide to Understanding Human Error” (Emphasis added)



# *Why are Human Factors Important?*

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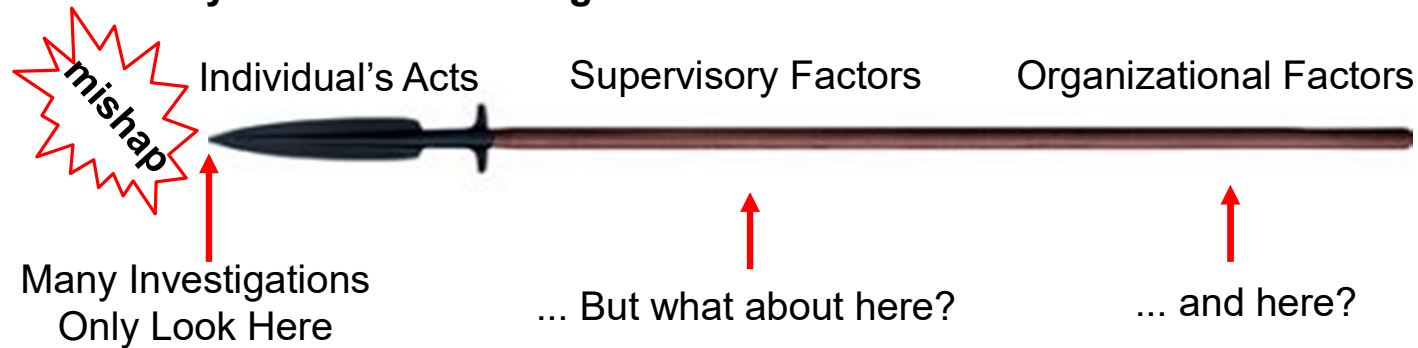
## ■ Humans are:

- Most pervasive (widespread) element at all levels
- Difficult to replace when damaged
- Often unpredictable when part of a complex system
- Flexible and adaptable
  - They learn and grow
  - (Usually) work to avoid mishaps
- The key to prevention



# Human Factor Analysis

Think of a spear – the mishap happened at the sharp pointy end, but there are many factors influencing the occurrence



**Actions the worker/individual took are best explained by looking at supervisory/organizational factors**

*Human Error “Failures can only be understood by looking at the whole system in which the behavior took place. But in our reactions to failure, we often focus on the sharp end, where people were closest to (potentially preventing) the mishap.” (Sydney Dekker)*

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## *Human Factors Mindset*

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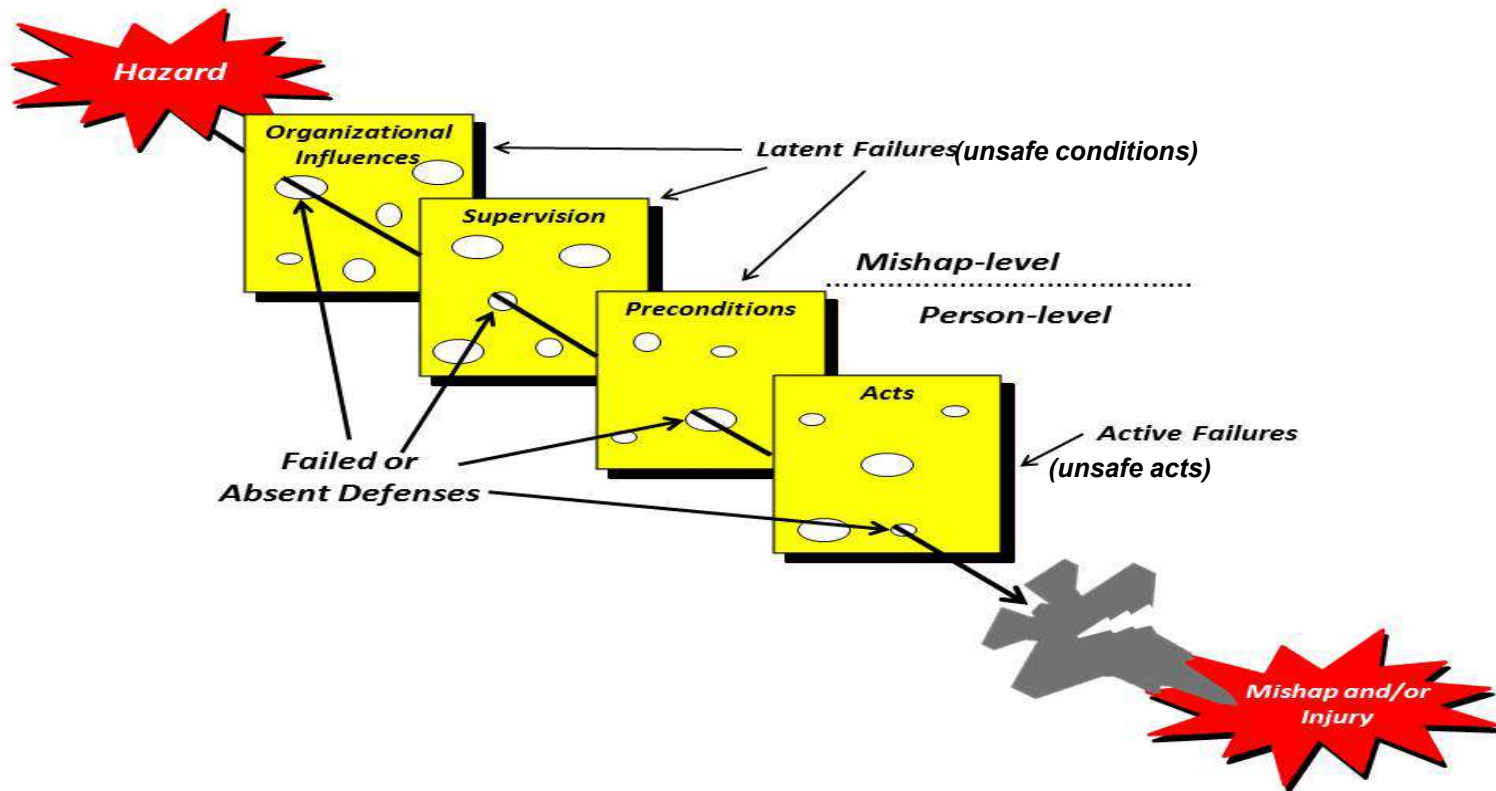
- **Think about human factors throughout the investigation!**
  - **Seek understanding from the perspective of those involved**
  - **Generate hypotheses to explain human behavior/decisions**
  - **Look for supporting evidence (or disconfirming evidence)**
  - **Consult with Human Factors SMEs<sup>1</sup>**
  
- **This explains the WHY behind human behaviors and produces a more robust investigation**

1. SMEs include MAJCOM HP personnel in aerospace medicine, aerospace physiology, and operational/aviation psychology as well as the AFSEC/HP team. More information is included in the second half of this slide set.





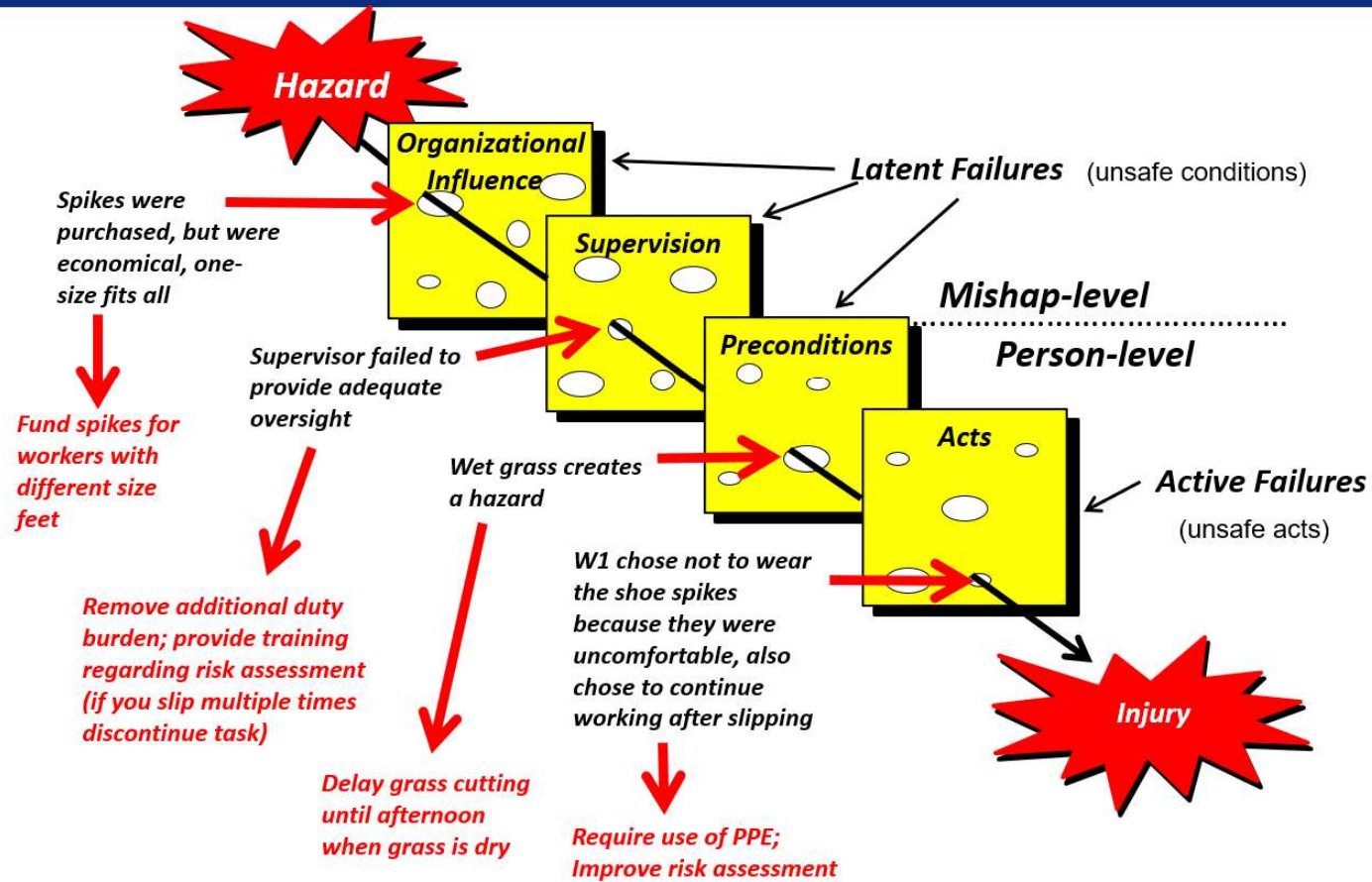
# Reason's "Swiss Cheese" Model



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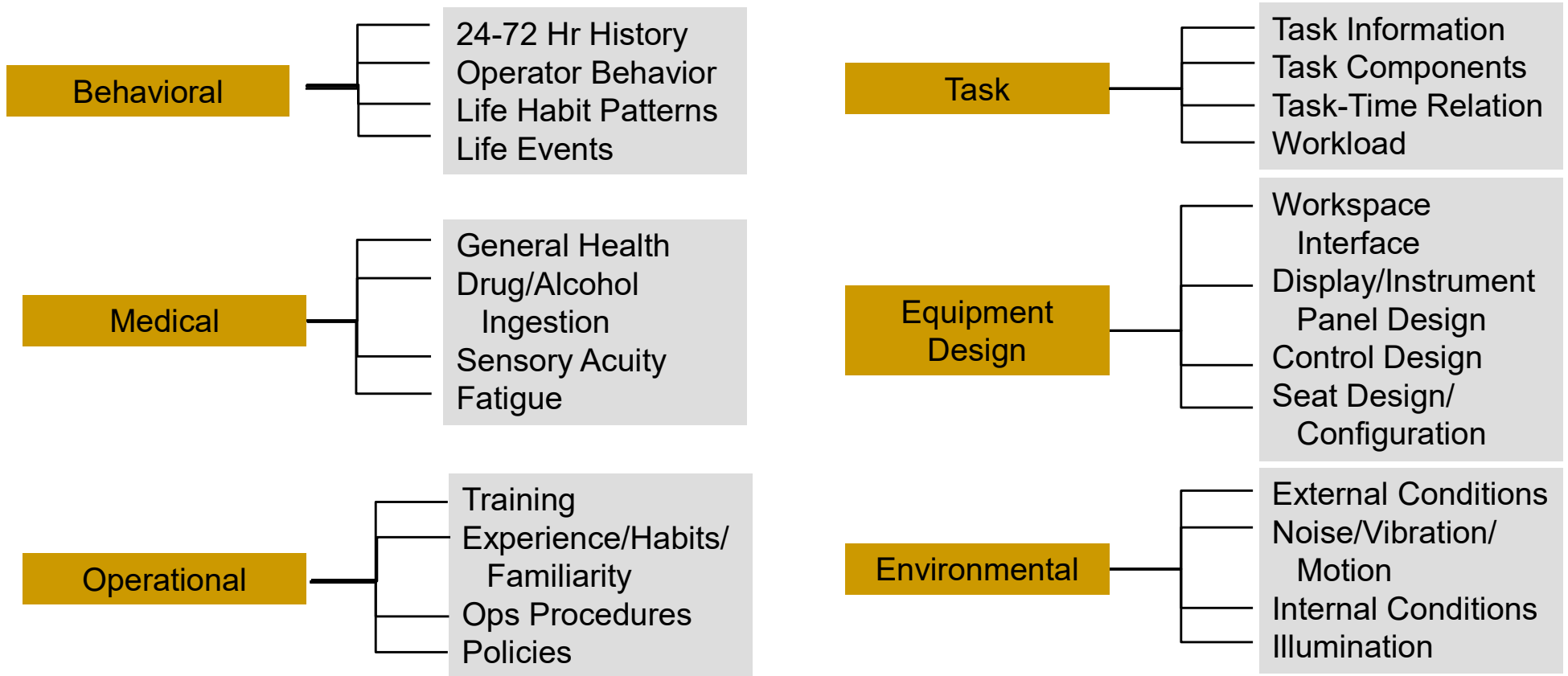
# HF Recommendations



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# NTSB Human Performance Factors





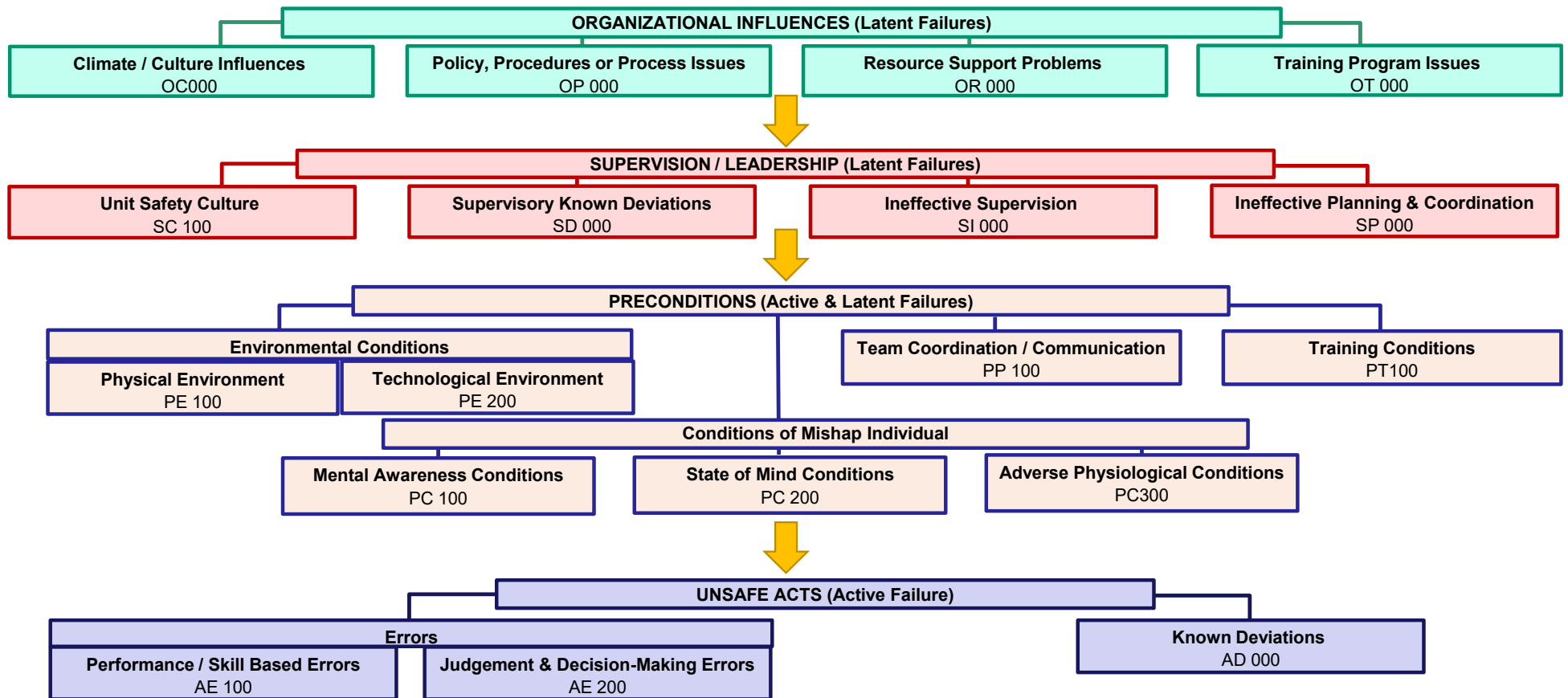
# *Human Factors vs. HFACS*

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- **Human Factors ≠ HFACS**
- **Human Factors = How human beings interact with technology, environment, systems, etc.**
- **HFACS = Analysis and coding system to classify human factors (taxonomy)**
  - **Analytical model to understand human contributions to mishaps**
  - **Common language for classification**
  - **Research tool to study historical errors/hazards through data pulls**



# DoD HFACS 8.0 Structure



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# *Investigation Taxonomy*

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- **Orderly classification of events according to their presumed natural relationships**
  - **Gives us a common language for discussing the relevant human factors – improves data pulls**
  - **A standardized method to capture the human contributions to the mishap**
- **Taxonomy can guide human factor investigation**
- **Human Factors are considered THROUGHOUT the investigation, but...**
- **Codes are applied AFTER the analysis is complete**



# ***What is the Human Factor within the Investigation?***

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- **Humans accomplish safety investigations**
- **It is not possible to avoid bias**
  - **Recognize bias exists**
  - **Acknowledge it**
  - **Look for appropriate counterfactuals**
- **Consider your approach to integrating data, be wary of specific types of bias**
- **Use Human Factors SMEs as board members and consultants to help mitigate bias**



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# Human Factors / Medical Resources

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## *Flight Medicine*

- Provides medical support to operational mission
- Directs health education and control measures for preventable diseases and Public Health issues
- Conducts occupational health surveillance
- Provides ISB/SIB medical member
- Establishes selection and retention standards
- SME for fly status, Arming and Use of Force
- Manages profiles
- Consider for:
  - Anything related to medical records, injury or illness



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## *Aerospace Physiology*

- Provides expertise for: altitude chambers, aeromedical aspects of flight, sensory physiology, aviation life support systems, acceleration physiology, and emergency egress.
- Aerospace Physiology Training Unit (APTU)
  - Human System Integration (HSI)
  - Physiology/Safety briefings
- Provide SIB Support
  - Serve on boards at request of BP and Flight Surgeon
  - Conduct fatigue/shift-work analysis
- Consider for:
  - Sensory Misperception
  - Technological Environment
  - Physical Environment



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# Psychology

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- **Clinical Psychologists are usually at your base**
  - **AMIC/AMIP trained psychologists can support investigations**
- **Aviation Psychologists**
  - **Advanced training re: cognitive, psychological, and emotional human factors impacting safety and human performance**
  - **Unit safety culture assessments and interventions**
- **Consider for:**
  - **Judgment and Decision Making**
  - **State of Mind**
  - **Mental Awareness**
  - **Teamwork**



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# Bioenvironmental Engineering

- Performs assessments for chemical, biological (e.g., potable water), radiological, and physical hazards in the work place and environment
- Determines the optimal PPE required for the specific task and adequacy use, maintenance and storage
- Part of confined space team along with safety and fire
- Wartime duties include NBC detection
- Consider for:
  - Workspace contributions to mishaps
  - Proper PPE
  - Any bio/chem hazard concerns



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# AFSEC Human Performance SMEs

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- Located at Kirtland AFB
- Provides Human Factors, medical, and AFE support to SIBs/SIOs
- Human Factors quality control for Exhibit T, Final Messages, MOFE
- Safety Culture: Administers safety culture assessments to CCs (AFCMRS), Organizational Safety Assessments (OSAs)
- Education: AMIC, AMIP, CoS, IFSO, ASPM, HFWSP, MINA
- Staff: Senior Flight Surgeon, Aerospace Physiologists, Aviation Psychologists, Pilots, Aircraft Mx
- Consider for:
  - Any Human Factors-related questions
  - Approach to investigations
  - Coding and recommendations
  - Survey Design Questions



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## ***Conclusion***

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